

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-057415

(43)Date of publication of application : 26.02.2003

(51)Int.Cl.

G02B 5/02
B32B 7/02
B32B 23/08
B32B 27/20
G02B 1/11
G02B 5/30
G02F 1/1335

(21)Application number : 2001-250534

(71)Applicant : FUJI PHOTO FILM CO LTD

(22)Date of filing : 21.08.2001

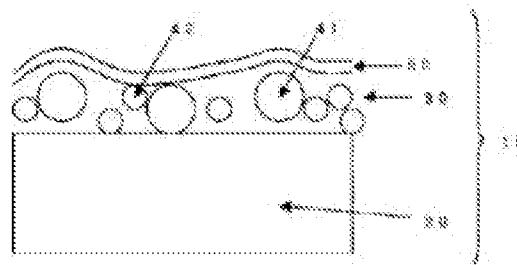
(72)Inventor : ITO YOJI

(54) OPTICAL DIFFUSION FILM, METHOD FOR MANUFACTURING THE SAME,
POLARIZING PLATE AND LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an optical diffusion film for realizing widening of a viewing angle of a liquid crystal display device, in particular, gray scale reversal in a downward direction of a panel at a higher level and further realizing a picture without blurring even in a high precision liquid crystal display device.

SOLUTION: In the optical diffusion film having at least one layer of an optical diffusion layer containing a translucent resin and translucent fine particles on a transparent substrate, the optical diffusion film is characterized by having the optical diffusion layer with \geq 40% haze value and with 30-99% mapping performance.



* NOTICES *

JPO and INPIT are not responsible for any
damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the light diffusing film which aims at improvement in display quality in detail, its manufacturing method, an antireflection film, a polarizing plate, and a liquid crystal display about the liquid crystal display element used for image display, such as a computer, a word processor, and Television Sub-Division.

[0002]

[Description of the Prior Art]Generally the liquid crystal display comprises a polarizing plate and a liquid crystal cell. The fault on the display quality of a liquid crystal display is a reflect lump of an angle of visibility and outdoor daylight. In the TN mode TFT-liquid-crystal display device which is the present mainstream about an angle of visibility, JP,H8-50206,A and JP,H7-191217,A -- and it is alike, an optical compensation film is inserted between a polarizing plate and a liquid crystal cell like a description on the European patent 0911656A No. 2 Descriptions, and the liquid crystal display of the wide viewing angle is realized extremely. However, the problem that the down tone reversal of PANARU produced the above-mentioned liquid crystal display remained. It is proposed by the patent No. 2822983 to this problem that display quality is remarkably improved by providing the optical means which diffuses a light diffusing means in JP,2001-33783,A, and diffuses emitted light in an optic-axis conversion board and JP,2001-56461,A in a visual recognition side surface. However, the concrete means given in these was a light diffusing means which has the lens structure controlled highly or diffraction mechanism, and a high price and mass production were dramatically difficult for it.

[0003]As cheapness and a light diffusing film which can be mass-produced, For example, so that it may be indicated by JP,H6-18706,A, JP,H10-20103,A, etc., What coated and formed resin containing fillers, such as a silica dioxide (silica), on the surface of the transparent substrate film, JP,H11-160505,A, JP,H11-305010,A, JP,H11-326608,A, JP,2000-121809,A,

JP,2000-180611,A, and JP,2000-338310,A are mentioned. However, even if it used the light diffusing film of the description for these Descriptions, the improvement in display quality was small.

[0004]What a liquid crystal display is used for the fine (high definition) monitor use of a pixel more often, and uses the above optical diffusion effects collided with big SUBJECT called dotage of a picture in recent years.

[0005]On the other hand, generally about a reflect lump of outdoor daylight, an antireflection film is used. An antireflection film is arranged in the outermost surface of the display which uses the principle of optical interference and reduces reflectance, in order to prevent reflected [the contrast drop by reflection of outdoor daylight or an image]. However, an antireflection film which is excellent in a reflect lump of the outdoor daylight instead of what can solve the problem of the above angles of visibility on the conventional antireflection film, and can solve the problem of an angle of visibility was desired.

[0006]

[Problem to be solved by the invention]The purpose of this invention is to provide the light diffusing film which can realize the picture which the tone reversal of a panel wide-field-of-view cornification of a liquid crystal display, especially down and outdoor daylight are reflected, and realizes lump prevention highly and, in which a highly minute liquid crystal display does not have dotage, either, and an antireflection film. An angle of visibility (especially down angle of visibility) expands the purpose of this invention, without thickening thickness of a liquid crystal panel, And it is in providing the polarizing plate by a visual angle change where whose endurance a contrast drop, gradation or monochrome reversal, a hue change, etc. hardly occurred, and improved further, and the liquid crystal display using it.

[0007]

[Means for solving problem]The purpose of this invention was attained by the liquid crystal display of following the (1) - (the manufacturing method of a light diffusing film the light diffusing film of 2), (3), and given in (4), the antireflection film of (5), polarization version of following the (6) - (8), and following (9).

[0008](1) The light diffusing film characterized by this light diffusion layer's being not less than 40% of a haze value in translucency resin and the light diffusing film which has at least one layer of light diffusion layers containing translucency particles, and image clarity being 30% thru/or 99% on a transparent base material.

(2) A light diffusing film given in (1), wherein the surface roughness of this light diffusion layer is 0.05 micrometer thru/or 0.18 micrometer.

(3) In the manufacturing method of the light diffusing film which paints further the light diffusion layer containing translucency resin and translucency particles at least on a transparent base material, At least one or more kinds of solvents in which the solvent of this light diffusion layer

coating liquid dissolves this transparent base material, A manufacturing method of a light diffusing film, wherein it comprises at least one or more kinds of solvents which do not dissolve this transparent base material, and this light diffusion layer is not less than 40% of a haze value and image clarity is 30% thru/or 99%.

(4) A manufacturing method of a light diffusing film given in (3), wherein this transparent base material is a cellulose acetate film and the solvent which does not dissolve this transparent base material is methyl isobutyl ketone.

(5) In the antireflection film which has at least one layer for the light diffusion layer containing translucency resin and translucency particles, and has a low refractive index layer of at least one layer on it on a transparent base material, An antireflection film, wherein the haze value of this light diffusion layer is not less than 40%, image clarity is 30% thru/or 99% and the average value in the wavelength zone from 450 nm to 650 nm of the mirror reflectivity in 5 times incidence of an antireflection film is 2.5% or less.

In a pinched polarizing plate, both sides of a polarizing layer with a protective film (6) A light diffusing film given in one side of a protective film (1) or (2), (3) Or a polarizing plate using a light scattering film manufactured by (4) with a manufacturing method of a description, or an antireflection film given in (5).

(7) A light diffusing film manufactured by a light diffusing film given in (a), (1), or (2), (3), or (4) with a manufacturing method of a description, or an antireflection film given in (5), (b) Light polarizer and a polarizing plate laminating an optical anisotropic layer which comprises (c) liquid crystallinity compound in this order.

(8) A polarizing plate given in (7) said whose liquid crystallinity compound is a discotic compound.

A liquid crystal display using for the outermost layer of a display a light scattering film manufactured by a light diffusing film given in (9), (1), or (2), (3), or (4) with a manufacturing method of a description, an antireflection film given in (5), or a polarizing plate given in (6) - (8) any 1 clause.

[0009]

[Mode for carrying out the invention]It is making it an antireflection film which traced that this invention had contribution in correlation in large internal dispersion Hayes and the angle-of-visibility improvement effect at diffusion of a haze value, especially the transmitted light, controlled surface roughness further, and laminated a specific low refractive index layer, A reflect lump and angle-of-visibility improvement of outdoor daylight can be attained, without sacrificing dotage of a picture (in state where image clarity is high).

[0010]That is, a view angle characteristic becomes good, so that it will be carried out, if light emitted from a back light diffuses with a light diffusing film installed in the polarizing plate surface by the side of visual recognition. However, if spread not much too much, or back-

scattering will become large and front brightness will decrease, dispersion is too large and a problem of picture clear nature deteriorating arises. Therefore, as internal dispersion Hayes, 30% thru/or 80% are preferred, 35% thru/or 70% are still more preferred, and 40% thru/or 60% are the most preferred. Or particle diameter raises translucency particulate concentration which is 0.5micro thru/or 1.5micro as a method of raising internal dispersion Hayes, there are methods, such as thickening thickness and raising a refractive index of these particles further. Apart from this, it is also required to provide surface Hayes by surface unevenness from a viewpoint of visibility, and it is in a state where this internal dispersion Hayes and surface Hayes exist, The angle-of-visibility improvement effect is demonstrated because it is not less than 40% as a haze value, 40% thru/or 90% are preferred, 45% thru/or 80% are still more preferred, and 50% thru/or 70% are the most preferred.

[0011]Although picture clear nature had a general opinion that it gets worse with a rise of Hayes, research showed [of this invention person] wholeheartedly that correlation was between surface roughness. That is, even if it is very big internal dispersion Hayes like this invention, if surface roughness is small, it can maintain at a state where image clarity is dramatically high. In order to correspond to a highly minute liquid crystal display, it is preferred that it is [not less than 30%] 99% or less, it is not less than 35% of 80% or less more preferably, and image clarity is not less than 40% of 70% or less still more preferably. In order to realize such image clarity, it is 0.16 micrometer or less that surface roughness Ra is 0.18 micrometer or less desirable still more preferably, and 0.14 micrometer or less is the most preferred. In order to provide surface Hayes suitable as mentioned above, it is preferred that surface roughness is 0.05 micrometers or more. Image clarity is the value (%) measured about a produced light diffusing film in 0.5-mm optical Cush using an image clarity measuring instrument by Suga Test Instruments Co., Ltd. (ICM-2D type), is a value calculated in JIS K 7105, and shows that surface smoothness is so high that a numerical value is high. Surface roughness is the value measured with an atomic force microscope (AFM:Atomic Force Microscope, SPI3800N, product made from SEIKO Instrument).

[0012]The surface roughness of a light diffusion layer is controllable by the binder ratio of the light diffusion layer. Becoming difficult to project translucency particles on a light diffusion layer by enlarging the ratio, surface roughness becomes small. As a method of enlarging a binder ratio, it is controllable by the method of enlarging the binder ratio in coating liquid, the solvent presentation of coating liquid, and a drying condition. From a viewpoint of making surface roughness small, it dries late so that leveling (smoothing) of the coating layer can fully be carried out, and as for a solvent presentation, it is still more preferred to make it hard (it does not dissolve) to sink into a transparent base material. However, it is required to mix with the solvent which sinks into a transparent base material to some extent (it dissolves) from a viewpoint of adhesion with a transparent base material and a light diffusion layer, and to use.

[0013]The temperature to solvent desiccation shall be 20 °C thru/ or 40 °C, and the most desirable combination as a solvent presentation specifically, It is preferred to choose comparatively early methyl ethyl ketone of desiccation, and to choose methyl isobutyl ketone which is the same ketones as a solvent which does not dissolve a transparent substrate film as a solvent which dissolves a transparent substrate film. As for the mass ratio (A/B) of each total amount, 10/93 thru/ or 30/70 are preferred, and 15/85 thru/ or 25 thru/ or 75 is still more preferred.

[0014]Light diffusion layer with mode much more at least on a triacetyl cellulose transparent substrate with a preferred antireflection film of this invention is provided, and the low refractive index layer of at least one layer is further provided on it.

[0015]Hereafter, the fundamental composition of the antireflection film of such this invention is explained, quoting Drawings. The mode shown in drawing 1 is an example of the antireflection film of this invention, and the antireflection film 1 has the lamination of an order of the transparent substrate 2 which consists of triacetyl cellulose, the light diffusion layer 3, and the low refractive index layer 4. The translucency particles 5 are distributing to translucency resin at the light diffusion layer 3. The light diffusion layer 3 may comprise two or more layers.

[0016]The refractive indices of translucency resin of a light diffusion layer are 1.51-2.00 preferably, and the refractive indices of a low refractive index layer are 1.35-1.45 preferably. The refractive index of the triacetyl cellulose preferably used as a transparent substrate is 1.48. Thus, by making the refractive index of a light scattering layer high, the refractive index of a low refractive index layer is excelled in the antireflection effect also in 1.35-1.45. Therefore, if too large [it shines if the refractive index of a scattering layer is too small, acid resistibility will fall, and], the tint of a reflected light becomes strong and is not preferred.

[0017]Hereafter, it explains still in detail about each layer which constitutes the antireflection film of this invention.

A <light diffusion layer> light diffusion layer comprises the above-mentioned translucency particles and translucency resin. Thereby, a haze value makes it to not less than 40% as mentioned above. As for the above-mentioned translucency particles, in order to acquire an effect suitable for this invention, it is preferred to use the translucency particles of two or more kinds of particle diameter. In this case, as for the 1st translucency particle 1, a silica particle (the mean particle diameter of 1.0 micrometer, refractive index 1.51) is mentioned, for example, and, as for the 2nd translucency particle 2, a bridge construction styrene bead (the mean particle diameter of 3.5 micrometers, refractive index 1.61) is mentioned, for example. These are mentioned later still in detail.

[0018]It is preferred that each difference of the refractive index of the translucency particles 1 and 2 and the translucency resin which constitutes the whole light diffusion layer is 0.02 or more and 0.15 or less. It is because the difference of both refractive index is too small, an

optical diffusion effect will not be able to be acquired, and light diffusibility is too high and the whole film will milk, when refractive index difference is larger than 0.15 when refractive index difference is less than 0.02. As for said refractive index difference, 0.03 or more and 0.13 or less are more preferred, and 0.04 or more and 0.10 or less are the best. It is preferred that the particle diameter of said translucency particle 1 is 0.5 micrometer thru/ or 2.0 micrometers. It did so in order to obtain the angular distribution of light scattering suitable for this invention.

[0019]In this invention, in order to raise display quality (down angle-of-visibility improvement), the more it is required to diffuse the light which entered to some extent and this diffusion effect is large, the more a visual angle characteristic improves. However, in order to maintain a front luminosity in respect of display quality, it is required to raise transmissivity as much as possible. When said particle diameter is less than 0.5 micrometer, the effect of dispersion is large, although a visual angle characteristic improves by leaps and bounds, back-scattering becomes large and reduction in a luminosity is intense. On the other hand, when exceeding 2.0 micrometers, the improvement in a visual angle characteristic becomes small in °C with a small scattering effect. Therefore, as for said particle diameter, 0.6 micrometer thru/ or 1.8 micrometers are more preferred, and 0.7 micrometer thru/ or 1.7 micrometers are the most preferred.

[0020]As for the particle diameter of said translucency particle 2, it is preferred that they are 2.5 micrometers thru/ or 5.0 micrometers. It did so in order to acquire surface dispersion suitable for this invention. In order to attain the display quality of this invention, it is also required to prevent a reflect lump of outdoor daylight. The Japanese quince of a display can be made small, and a clear display display can be obtained so that a surface haze value is low, but if a haze value is too low, the sparkling brightness which is called reflected and field GIRA (scintillation) will occur. On the contrary, if too high, it will become whitish (white blush mark; black density fall), and as for the surface haze value h_s , $0.5 < h_s < 30$ is preferred, $3 < h_s < 20$ is still more preferred, and $7 < h_s < 15$ is the most preferred. In order to control this surface haze value, it is used as a form with preferred providing moderate unevenness in the resin layer surface by particles. A haze value (haze value) can be measured using hazemeter MODEL 1001DP (made by Nippon Denshoku Industries Co., Ltd.).

[0021]When said particle diameter is less than 2.5 micrometers, surface unevenness becomes small, and its effect of surface dispersion is small and it cannot fully suppress a reflect lump by outdoor daylight. On the other hand, when exceeding 5.0 micrometers, surface unevenness becomes large, and a reflect lump is suppressed, but it will milk remarkably and display quality will be dropped conversely. Therefore, as for said particle diameter, 2.2 micrometers thru/ or 4.7 micrometers are preferred, and 2.4 micrometers thru/ or 4.5 micrometers are the most preferred.

[0022]In said translucency particle, by mixing these translucency particles using translucency

particles from which two or more kinds of particle diameter differ, A reflect lump of a visual angle characteristic and outdoor daylight in connection with display quality can be optimized uniquely respectively, fine setting out is attained with the mixture ratio of translucency particles, control becomes more possible than a case where it is one kind, and various designs become easy.

[0023] Said translucency particles 1 and 2 may be monodisperse organic particulates, or may be inorganic particles. Dispersion decreases in a scattering characteristic and a design of haze value becomes easy, so that there is no dispersion in particle diameter. As said translucency particle, a plastic bead is preferred, especially transparency is high, and that from which refractive index difference with translucency resin becomes the above numerical values is preferred. As a plastic bead, a polymethylmethacrylate bead (refractive index 1.51), An acrylic styrene copolymer bead (refractive index 1.55), a melamine bead (refractive index 1.57), A polycarbonate bead (refractive index 1.57), a styrene bead (refractive index 1.60), bridge construction polystyrene beads (refractive index 1.61), a polyvinyl chloride bead (refractive index 1.60), a benzoguanamine melamineformaldehyde bead (refractive index 1.68), etc. are used.

[0024] The particle diameter of a plastic bead is good to choose a 0.5-5-micrometer thing suitably, and to use it as mentioned above, and good to carry out 5-30 mass-part content to translucency resin 100 mass part.

[0025] In the case of the above translucency particles, since translucency particles sediment easily in a resin composite (translucency resin), inorganic fillers, such as silica, may be added for the prevention from sedimentation. Although it is so effective in the prevention from sedimentation of translucency particles that the addition of an inorganic filler increases, it has an adverse effect on the transparency of a coat. Therefore, it is good to carry out less than 0.1 mass % grade content of the inorganic filler with a particle diameter of 0.5 micrometer or less preferably, to such an extent that the transparency of a coat is not spoiled to translucency resin.

[0026] As translucency resin, three kinds of what mixed the solvent with thermoplastics, and heat-hardened type resin are used for the resin hardened mainly with ultraviolet rays and an electron beam, i.e., ionizing radiation curing type resin, and ionizing radiation curing type resin. The thickness of a light diffusion layer shall usually be 0.5 micrometer - about 50 micrometers, and is preferably good to be most preferably referred to [1 micrometer - 20 micrometers / 2 micrometers - 10 micrometers] as 3 micrometers thru/or 7 micrometers still more preferably. The refractive indices of this translucency resin are 1.51-2.00 preferably, are 1.53-1.95 more preferably, are 1.57-1.90 still more preferably, and are 1.64-1.80 especially preferably. The refractive index of translucency resin is the value measured without including translucency particles. If a refractive index is too small, acid resistibility will fall. If this is too large, the tint of

a reflected light becomes strong and is not preferred.

[0027] As for a binder used for this translucency resin, it is preferred that it is polymer which has saturated hydrocarbon or polyether as a main chain, and it is still more preferred that it is polymer which has saturated hydrocarbon as a main chain. As for a binder, it is preferred to construct the bridge. As for polymer which has saturated hydrocarbon as a main chain, it is preferred to obtain by a polymerization reaction of an ethylenic unsaturated monomer. In order to obtain a binder which is constructing the bridge, it is preferred to use a monomer which has two or more ethylenic unsaturation groups.

[0028] For an example of a monomer which has two or more ethylenic unsaturation groups. ester (an example and ethylene glycol di(metha)acrylate.) of polyhydric alcohol and acrylic acid (meta-) 1, 4-JIKURO hexane diacrylate, pentaerythritol tetra (meta) acrylate, Pentaerythritol bird (meta) acrylate, trimethylolpropane bird (meta) acrylate, Trimethylolethane tri(metha) acrylate, dipentaerythritol tetra (meta) acrylate, Dipentaerythritol penta (meta) acrylate, dipentaerythritol hexa (meta) acrylate, 1,3,5-cyclohexanetriol trimethacrylate, polyurethane polyacrylate, a derivative (an example and 1,4-divinylbenzene.) of polyester polyacrylate and vinylbenzene 4-vinylbenzoic acid-2-acryloyl ethyl ester, 1,4-divinylcyclohexanone, a vinylsulfone (an example, a divinylsulfone), acrylamide (an example, methylenebis acrylamide), and methacrylamide are contained. Acrylate which has at least three functional groups also in these or a methacrylate monomer, and an acrylate monomer which has at least five functional groups further are preferred in a viewpoint of film hardness, i.e., damage resistance. A mixture of dipentaerythritol pentaacrylate and dipentaerythritol hexaacrylate is marketed and it is used especially preferably.

[0029] A monomer which has these ethylenic unsaturation groups can be hardened by a polymerization reaction by ionizing radiation or heat after the dissolution, spreading, and desiccation to a solvent with a polymerization initiator and various kinds of other additive agents.

[0030] In addition to it instead of a monomer which has two or more ethylenic unsaturation groups, the structure of cross linkage may be introduced into a binder by the reaction of a cross-linking group. An isocyanate group, an epoxy group, an aziridine group, an oxazoline group, an aldehyde group, a carbonyl group, a hydrazine group, a carboxyl group, a methylol group, and an active methylene group are contained in an example of a cross-linking functional group. Vinylsulfonic acid, an acid anhydride, a cyanoacrylate derivative, melamine, etherification methylol, ester and urethane, and a metal alkoxide like a tetramethoxy silane can also be used as a monomer for introducing the structure of cross linkage. Like a block isocyanate group, a functional group which shows cross-linking may be used as a result of a decomposition reaction. That is, even if a cross-linking functional group does not immediately show a reaction in this invention, reactivity may be shown as a result of decomposing. The

binder which has these cross-linking functional group can form the structure of cross linkage by heating after spreading.

[0031]As for translucency resin, it is preferred to be formed from the metallic-oxide ultrafine particle etc. which have a monomer which has a high refractive index in this, and/or a high refractive index in addition to the above-mentioned binder polymer. A bis(4-methacryloyl thiophenyl)sulfide, vinyl naphthalene, vinyl phenylsulfide, a 4-methacryloxy-phenyl-4'-methoxyphenyl thioether, etc. are contained in the example of a high-refractive-index monomer. It is [particle diameter of 100 nm or less which becomes an example of the metallic-oxide ultrafine particle which has a high refractive index from a zirconium, titanium, aluminum, indium, zinc, tin, and at least one oxide chosen from the inside of antimony] preferred to contain a particle of 50 nm or less preferably. The oxide ultrafine particle of at least one sort of metal chosen from aluminum, Zr, Zn, Ti, In, and Sn as a metallic-oxide ultrafine particle which has a high refractive index is preferred, and as an example, ZrO_2 , TiO_2 , aluminum O_3 , In_2O_3 , ZnO , SnO_2 , Sb_2O_3 , ITO, etc. are mentioned. Also in these, ZrO_2 is used especially preferably.

As for the monomer of a high refractive index, or the addition of a metallic-oxide ultrafine particle, it is preferred that it is ten to 90 mass % of the total mass of translucency resin, and it is still more preferred in it being 20 to 80 mass %.

[0032]When translucency resin and a transparent substrate film touch, the solvent of the coating liquid for forming translucency resin, In order to aim at anti-dazzle manifestation and coexistence of the adhesion of a between [a base material and an anti-glare layer], it constitutes from at least one or more kinds of solvents which dissolve a transparent substrate film (for example, triacetyl cellulose base material), and at least one or more kinds of solvents which do not dissolve a transparent substrate film. the solvent in which at least one kind in the solvent which does not dissolve a transparent substrate film dissolves a transparent substrate film more preferably -- it is more preferred than at least one kind that it is a high boiling point. Still more preferably, among the solvents which do not dissolve a transparent substrate film, among a solvent with the highest boiling point, and the solvent which dissolves a transparent substrate film, it is that a boiling-point-temperature difference with a solvent with the highest boiling point is not less than 30 **, and is not less than 50 ** most preferably.

[0033]as the solvent which dissolves a transparent substrate film (preferably triacetyl cellulose) -- the number of carbon children -- ether [of 3-12]: -- specifically, Dibutyl ether, dimethoxymethane, dimethoxyethane, diethoxyethane, Propylene oxide, 1,4-dioxane, 1,3-dioxolane, carbon numbers, such as a 1,3,5-trioxane, a tetrahydrofuran, an anisole, and phenetol, -- ketone [of 3-12]: -- specifically, Acetone, methyl ethyl ketone, a diethyl ketone, dipropyl ketone, carbon numbers, such as diisobutyl ketone, cyclopentanone, cyclohexanone, methylcyclohexanone, and methylcyclohexanone, -- ester species [of 3-12]: -- specifically, Ethyl formate, propyl formate, formic acid n-pentyl, methyl acetate, ethyl acetate, methyl

propionate, propione ** ethyl, n-pentyl acetate, gamma-PUCHIRO lactone, etc., [0034]The organic solvent which has two or more kinds of functional groups : specifically, 2-methoxy methyl acetate, 2-ethoxymethyl acetate, 2-ethoxyethyl acetate, 2-ethoxyethyl propionate, 2-methoxyethanol, 2-propoxyethanol, 2-butoxyethanol, 1,2-diacetoxyacetone, an acetylacetone, diacetone alcohol, methyl acetoacetate, ethyl acetoacetate, etc. are mentioned. these are one-sort independent -- it is -- it can use combining two or more sorts.

[0035]As a solvent which does not dissolve a transparent substrate film (preferably triacetyl cellulose), Methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-butanol, tert-butanol, 1-pentanol, 2-methyl-2-butanol, Cyclohexanol, isobutyl acetate, methyl isobutyl ketone, 2-octanone, 2-pentanone, 2-hexanone, 2-heptanone, 3-pentanone, 3-heptanone, and 4-heptanone are mentioned. A thing desirable as a solvent which does not dissolve a transparent substrate film (preferably triacetyl cellulose) is methyl isobutyl ketone. these are one-sort independent -- it is -- it can use combining two or more sorts.

[0036]5 / 95 - 50/50 are preferred, and are 10 / 90 - 40/60 more preferably, and mass ratios (A/B) of a total amount (A) of a solvent which dissolves a transparent substrate film, and a total amount (B) of a solvent which does not dissolve a transparent substrate film are 15 / 85 - 30/70 still more preferably.

[0037]As a curing method of the above ionizing-radiation-curing-type-resin constituents, it can harden by the exposure of the usual curing method of said ionizing-radiation-curing-type-resin constituent, i.e., an electron beam, and ultraviolet rays.

[0038]In electron beam hardening, for example, a tap ROFUWARUTON type, a BANDE graph type, 50 emitted from various electron beam accelerators, such as a resonance transformation type, an insulation core transformer type, a linear model, the Dynamitron type, and a high frequency type, - 1000KeV, The electron beam etc. which have the energy of 100 - 300KeV preferably are used, and when it is ultraviolet curing, the ultraviolet rays etc. which are emitted from beams of light, such as an ultrahigh pressure mercury lamp, a high-pressure mercury-vapor lamp, a low pressure mercury lamp, a carbon arc, a xenon arc, and a metal halide lamp, can be used.

[0039][Low refractive index layer] A low refractive index layer is the purpose of carrying out antireflection ability grant, and is provided in the outermost layer of the side which provided the light diffusion layer on the base material as an antireflection layer. The refractive indicees of a low refractive index layer are 1.35-1.45 preferably as above-mentioned. As for the refractive index of a low refractive index layer, it is preferred to fill following expression (I).

$$(m\lambda/4) \times 0.7 < n_1 d_1 < (m\lambda/4) \times 1.3 \dots \text{Expression (I)}$$

The number of m is odd [positive] (generally 1) among a formula, and n_1 is a refractive index of a low refractive index layer, and d_1 is the thickness (nm) of a low refractive index layer.

lambda is the wavelength of visible light and is a value of the range of 450-650 (nm). Filling the above-mentioned expression (I) means that m (it is positive odd number and usual [1]) which fills expression (I) in the range of the above-mentioned wavelength exists.

[0040]The fluorine-containing resin which the thermosetting or ionizing radiation hardening type cross-linking fluorine-containing compound hardened is used for the low refractive index layer of this invention. Thereby, compared with the low refractive index layer using magnesium fluoride or calcium fluoride, even if it uses as the outermost layer, it excels in damage resistance. As a refractive index of a thermosetting or ionizing radiation hardening type cross-linking fluorine-containing compound, 1.45 or less [1.35 or more] are preferred. The dynamic friction coefficient of the hardened fluorine-containing resin is preferred, and the angle of contact over 0.03 to 0.15 and water is 90 to 120 degrees preferably. as such a cross-linking fluorine-containing compound -- a perfluoroalkyl group content silane compound (for example (heptafluoro-1,1,2,2-tetradecyl), triethoxysilane) etc. -- others. The fluorine-containing copolymer which makes a constitutional unit a fluorine-containing monomer and the monomer for cross-linking group grant is mentioned.

[0041]as the example of a fluorine-containing monomer unit -- for example, fluoro olefins (for example, fluoroethylene.) Vinylidene fluoride, tetrafluoroethylene, hexafluoro ethylene, Hexafluoropropylene, the perfluoro 2,2-dimethyl- 1, 3-JIOKI sole, etc., (Meta) It is the portion or the full fluorination alkyl ester derivatives (for example, screw coat 6FM (product made from Osaka Organic Chemistry Division), M-2020, etc. (made by Daikin)), completeness, or partial fluorination vinyl ether of acrylic acid, etc.

[0042]The acrylate monomer etc. which have a cross-linking functional group beforehand in intramolecular like glycidyl methacrylate as a monomer for cross-linking group grant (meta). The acrylate monomers (for example (meta), acrylic acid, methylol (meta) acrylate, hydroxyalkyl (meta) acrylate, allyl acrylate, etc.) which have a carboxyl group, hydroxyl, an amino group, a sulfonic group, etc. (meta) are mentioned. It is indicated by JP,H10-25388,A and JP,H10-147739,A that the latter can introduce the structure of cross linkage after copolymerization.

[0043]Not only the copolymer of the above-mentioned fluorine-containing monomer and the monomer for cross-linking group grant but the polymer in which other monomers carried out copolymerization to this may be used for a low refractive index layer. there is no limitation in particular in the monomer of others which may carry out copolymerization -- for example, olefins (ethylene.) acrylic ester (methyl acrylate.), such as propylene, isoprene, VCM/PVC, and a vinylidene chloride Methyl acrylate, ethyl acrylate, 2-ethylhexyl acrylate, methacrylic acid ester (methyl methacrylate and ethyl methacrylate.) styrene derivatives (styrene.), such as butyl methacrylate and ethylene glycol dimethacrylate Vinyl ether (methyl vinyl ether etc.), such as divinylbenzene, vinyltoluene, and alpha-methylstyrene. Vinyl ester, acrylamide (vinyl

acetate, vinyl propionate, and vinyl cinnamic acid), methacrylamide (N-tert-butylacrylamide, N-cyclohexylacrylamide, etc.), an AKURIRO 2 tolyl derivative, etc. can be mentioned.

[0044]In order to give damage resistance to the fluorine-containing resin used for a low refractive index layer, mean particle diameter is preferred and it is preferred to add and use the oxide ultrafine particle of 0.001-0.05 micrometer of Si more preferably 0.1 micrometer or less. From a viewpoint of acid resistibility, although it is so desirable that a refractive index is low, if the refractive index of fluorine-containing resin is lowered, damage resistance will get worse. Then, the best point of the balance of damage resistance and a low refractive index can be found out by optimizing the refractive index of fluorine-containing resin, and the addition of the oxide ultrafine particle of Si. the silica distributed by the commercial organic solvent as an oxide ultrafine particle of Si -- sol may be added to coating liquid as it is, or various commercial silica powder objects may be distributed and used for an organic solvent.

[0045]The antireflection film of this invention, It is preferred that the vertical peel charge measured by ordinary temperature normal relative humidity to either triacetyl cellulose (TAC) or polyethylene terephthalate (PET) is -200 pc / (picocoulomb), cm^2 - +200 pc (picocoulomb) / cm^2 . It is -100 pc/cm - +100 pc/cm² more preferably, is -50 pc/cm² - +50 pc/cm² still more preferably, and is 0pc/cm² most preferably. Here, pc (picocoulomb) of a unit is a 10⁻¹² coulomb. Still more preferably, the vertical peel charge measured by 10% of ordinary temperature RH is -100 pc/cm² - +100 pc/cm², is -50 pc/cm² - +50 pc/cm² still more preferably, and is 0pc/cm² most preferably.

[0046]The measuring method of vertical peel charge is as follows. The measuring sample is beforehand neglected under the environment of measurement temperature humidity for 2 hours or more. The measuring device consisted of a head which holds the stand which places a measuring sample, and a partner's film, and can repeat sticking by pressure and exfoliation from a top to a measuring sample, and the electrometer which measures electrification quantity on this head is connected. The anti-dazzle property antireflection film to measure is put on a stand, and a head is equipped with TAC or PET. After discharging a measured part, it repeats making a head stick to a measuring sample by pressure, and making it exfoliate, the value of electrification at the time of the 1st exfoliation and the 5th exfoliation is read, and this is averaged. A sample is changed, and this is repeated with three samples, and let what averaged all be vertical peel charge.

[0047]Although it may be charged in the case where it is charged in plus according to the kind of a partner film or measuring sample, and minus, the size of an absolute value poses a problem. Generally the absolute value of electrification of the direction under the environment of low humidity becomes large. This absolute value of the anti-dazzle property antireflection film of this invention is also small.

[0048] Since the absolute value of the vertical peel charge in ordinary temperature normal relative humidity and 10% of ordinary temperature RH is small, the antireflection film of this invention is excellent in protection-against-dust nature. In order to make the value of vertical peel charge into the above-mentioned range, it is carried out by adjusting the rate of the various elements of an antireflection film surface.

[0049] The surface resistance values of the antireflection film of this invention of more than $1 \times 10^{11} \Omega$ are $1 \times 10^{12} \Omega$ / more than Ω preferably. The measuring method of a surface resistance value is a circle electrode method indicated to JIS. That is, the current value 1 minute after voltage impressing is read, and a surface resistance value (SR) is calculated. In this invention, a view differs from the method of improving protection-against-dust nature (garbage antisticking nature) by making a surface resistance value below make it small, for example, $1 \times 10^{10} \Omega$, fundamentally. Since the absolute value of vertical peel charge is made small by the method which did not adopt this method in order that at least an image display article might fall, but was described above in this invention, it is not necessary to make a surface resistance value small, a surface resistance value can be made more than $1 \times 10^{11} \Omega$, and at least an image display article does not fall.

[0050] The average value in the wavelength zone from 450 nm to 650 nm of the mirror reflectivity in 5 times incidence is 2.5% or less, and 1.2% or less of the antireflection film of this invention is desirable, and is 1.1% or less more preferably. It is preferred that the average value in the wavelength zone from 450 nm to 650 nm of the rate of integrated reflection in 5 times incidence is 2.5% or less, and it is 2.3% or less more preferably.

[0051] It explains also in the mirror reflectivity in the above-mentioned 5 times incidence, and 5 times incidence. The mirror reflectivity in 5 times incidence is the rate of luminous intensity reflected at the normal line direction-5 degree to the light which entered from +five normal line directions of a sample, and becomes a measure reflected [by the specular reflexion of a background]. In applying to an anti-dazzle property antireflection film, the luminous intensity which reflected only the part of the scattered light resulting from the surface unevenness provided for anti-dazzle property grant at normal line direction-5 degree becomes weak. Therefore, mirror reflectivity can be called measuring method reflecting contribution of both anti-dazzle property and acid resistibility.

[0052] On the other hand, the rate of integrated reflection in 5 times incidence is a rate of the integral value of luminous intensity reflected in all the directions over the light which entered from +five normal line directions of a sample. Since reduction of the reflected light by anti-dazzle property does not take place in applying to an antireflection film, measurement only reflecting acid resistibility is possible. Therefore, it becomes possible by making the average value in the wavelength zone from 450 nm to 650 nm of the reflectance of above both into

2.5% or less (mirror reflectivity) and 2.5% or less (rate of integrated reflection), respectively to satisfy anti-dazzle property and acid resistibility simultaneously.

[0053] If the average value in the wavelength zone from 450 nm to 650 nm of the mirror reflectivity in 5 times incidence of an antireflection film exceeds 2.5%, reflected [a background] will be worrisome and visibility when it applies to the surface film of a display device will fall. On the other hand, if the average value in the wavelength zone from 450 nm to 650 nm of the rate of integrated reflection in 5 times incidence of an antireflection film exceeds 2.5%, The contrast improvement effect of a display device decreases, a display screen milks by the scattered light of the surface unevenness reason for anti-dazzle property grant, and the display quality of a display device falls.

[0054] When the tint of the regular reflection light to the 5 times incident light of the CIE standard light source D65 turns in fixed quantity with L^* of a CIE1976 $L^*a^*b^*$ color space, a^* , and b^* value, the antireflection film of this invention, It is preferred to be designed enter within the limits of $L^* \leq 10$, $0 < a^* \leq 2$, and $-5 \leq b^* \leq 2$, respectively. The tint of the regular reflection light which fills this is a neutral tint. The tint of the regular reflection light to the 5 times incident light of the CIE standard light source D65, From the spectrum reflection spectrum produced by computing the actual measurement of the mirror reflectivity in a field with a wavelength [in 5 times incidence] of 380 to 780 nm, and the product of the spectral distribution in each wavelength of the light source D65. It can change in fixed quantity by computing L^* value of a CIE1976 $L^*a^*b^*$ color space, a^* value, and b^* value, respectively. Acid resistibility is not enough if L^* value is larger than ten. When a^* value is larger than two, the red purple of a reflected light is strong, and green becomes strong and is not conversely preferred at less than zero. If b^* value has strong blueness less than [-5] and is larger than 2, yellow becomes strong and is not preferred.

[0055] The antireflection film which has a reflected light of such a neutral tint, and has low reflectance is obtained by optimizing the balance of the refractive index of a low refractive index layer, and the refractive index of the binder raw material of an anti-glare layer. Generally, although the antireflection film by the optical thin film by vacuum evaporation of three or more layers, a sputtering, etc. can reduce the average value of mirror reflectivity to 0.3% or less, therefore can also reduce L^* value or less to three, Although 10 or more and b^* value turned into a value below -10 in a^* value and the tint of the reflected light became very strong, with the anti-dazzle property antireflection film of this invention, it is substantially improved in respect of the tint of this reflected light.

[0056] As a raw material of a <transparent base material> transparent base material, there are a transparent resin film, a transparent resin plate, a transparent resin sheet, and clear glass. As a transparent resin film, a triacetyl cellulose (TAC) film (refractive index 1.48), A polyethylene terephthalate (PET) film, a diacetylene cellulose film, An acetate-butylate

cellulose film, a polyether sulphone film, A poly acrylic resin film, a polyurethane system resin film, polyester film, A polycarbonate film, a polysulfone film, a polyether film, a polymethyl pentene film, a polyether ketone film, an acrylic (meta) nitril film, etc. can be used. Thickness shall usually be 25 micrometers - about 1000 micrometers. It is preferred to use the cellulose acetate film generally used as a protective film of a polarizing plate as a transparent base material of this invention, in order to use for the outermost surface of a polarizing plate. Henceforth, transparency is high, it is smooth and the surface explains the cellulose acetate film which can be especially used for the transparent substrate film of the light scattering film of this invention preferably.

[0057]It is preferred that an acetylation degree uses the cellulose acetate which is 59.0 thru/or 61.5% in <quantity transparency and high smooth cellulose acetate film> this invention. An acetylation degree means the joint acetic acid quantity per cellulose unit mass. An acetylation degree follows the measurement and calculation of a degree of acetylation in ASTM:D-817-91 (the examining methods, such as cellulose acetate). As for the viscosity average degree of polymerization (DP) of cellulose ester, it is preferred that it is 250 or more, and it is still more preferred that it is 290 or more. As for the cellulose ester used for this invention, it is preferred that the molecular weight distribution of Mw/Mn (Mw is average molecular weight and Mn is a number average molecular weight) by gel permeation chromatography is narrow. As a value of concrete Mw/Mn, it is preferred that it is 1.0 thru/or 1.7, it is still more preferred that it is 1.3 thru/or 1.65, and it is most preferred that it is 1.4 thru/or 1.6.

[0058]Generally, a hydroxyl group of 2, 3, and 6 of a cellulose reed rate is not necessarily distributed uniformly [whole degree of substitution] to every [3 / 1/], and has the tendency for the degree of substitution of a hydroxyl group to become small the 6th place. In this invention, more ones have the preferred degree of substitution of 6 place hydroxyl group of a cellulose reed rate compared with the 2 or 3rd place. It is preferred that a hydroxyl group of the 6th place is replaced by an acyl group not less than 32% to the whole degree of substitution, and also it is preferred that it is especially not less than 34% not less than 33%. It is still more preferred that the degree of substitution of an acyl group is 0.88 or more the 6th place of a cellulose reed rate. A hydroxyl group may be replaced the 6th place by a propionyl group, a BUCHIROIRU group, the Barrero yl groups, benzoyl, an acrylyl group, etc. which are with a carbon numbers of three or more acyl groups in addition to an acetyl group. It can ask for measurement of the degree of substitution of each position by NMR. "0043" - "0044" given [as a cellulose reed rate of this invention] in JP,11-5851,A -- "an embodiment [synthetic example 1]" and "0048" - "0049 [synthetic example 2]" and "0051" - cellulose acetate obtained by a method of "0052 [the synthetic example 3]" can be used.

[0059][Manufacture of a cellulose acetate film] It is preferred to manufacture a cellulose acetate film by the solvent cast method. In the solvent cast method, a film is manufactured

using a solution (dope) which dissolved cellulose acetate in an organic solvent. As for an organic solvent, it is preferred that a solvent in which ether of 3 thru/or 12 and the number of carbon atoms are chosen for the number of carbon atoms, and ester and the number of carbon atoms of 3 thru/or 12 are chosen for ketone of 3 thru/or 12 and the number of carbon atoms from halogenated hydrocarbon of 1 thru/or 6 is included. Ether, ketone, and ester may have cyclic structure. A compound which has two or more either of the functional groups (namely, -O-, -CO-, and -COO-) of ether, ketone, and ester can also be used as an organic solvent. An organic solvent may have other functional groups like an alcoholic hydroxyl group. In the case of an organic solvent which has two or more kinds of functional groups, the number of carbon atoms should just be in a stipulated range of a compound which has one of functional groups. [0060]Diisopropyl ether, dimethoxymethane, dimethoxyethane, 1,4-dioxane, 1,3-dioxolane, a tetrahydrofuran, an anisole, and phenetol are contained in an example of ether of 3 thru/or 12 for the number of carbon atoms. Acetone, methyl ethyl ketone, a diethyl ketone, diisobutyl ketone, cyclohexanone, and methylcyclohexanone are contained in an example of the ketone of 3 thru/or 12 for the number of carbon atoms. Ethyl formate, propyl formate, pentyl formate, methyl acetate, ethyl acetate, and pentyl acetate are contained in an example of ester species of 3 thru/or 12 for the number of carbon atoms.

[0061]2-ethoxyethyl acetate, 2-methoxyethanol, and 2-butoxyethanol are contained in an example of an organic solvent which has two or more kinds of functional groups. As for the number of carbon atoms of halogenated hydrocarbon, it is preferred that it is 1 or 2, and it is most preferred that it is 1. As for halogen of halogenated hydrocarbon, it is preferred that it is chlorine. As for a rate that a hydrogen atom of halogenated hydrocarbon is replaced by halogen, it is preferred that it is [25 thru/or 75 mol] %, it is more preferred that it is [30 thru/or 70 mol] %, it is still more preferred that it is [35 thru/or 65 mol] %, and it is most preferred that it is [40 thru/or 60 mol] %. Methylenechloride is typical halogenated hydrocarbon. Two or more kinds of organic solvents may be mixed and used.

[0062]A cellulose acetate solution can be prepared by a general method. A general method is 0 ** or more in temperature (ordinary temperature or elevated temperature), and means processing. Preparation of a solution can be carried out using the preparing method and equipment of a dope in the usual solvent cast method. In the case of a general method, it is preferred to use halogenated hydrocarbon (especially methylenechloride) as an organic solvent. A non-chlorine solvent can also be used and what is indicated to the journal of technical disclosure 2001-1745 is raised about it. the inside of the solution in which the quantity of cellulose acetate is obtained -- ten -- or it adjusts 40 mass % so that it may be contained. As for the quantity of cellulose acetate, it is still more preferred that it is 10 thru/or 30 mass %. The arbitrary additive agents mentioned later may be added in an organic solvent (main solvent). A solution can be prepared by stirring cellulose acetate and an organic solvent

at ordinary temperature (0 thru/or 40 °). A high-concentration solution may be stirred under application of pressure and heating conditions. Cellulose acetate and an organic solvent are put into a pressurized container, and are sealed, and specifically, it stirs, heating to the temperature of the range which more than the boiling point in the ordinary temperature of a solvent and a solvent do not boil under application of pressure. Cooking temperature is usually not less than 40 °, is 60 thru/or 200 ° preferably, and is 80 thru/or 110 ° still more preferably.

[0063]Each ingredient may be put into a container, after rough-mixing beforehand. It may supply to a container one by one. The container needs to be constituted so that it can stir. Inert gas, such as nitrogen gas, is poured in and a container can be pressurized. The rise of the steam pressure of the solvent by heating may be used. Or each ingredient may be added under a pressure after sealing a container. When heating, heating from the exterior of a container is preferred. For example, jacket type heating apparatus can be used. The whole container can also be heated by forming a plate heater in the exterior of a container, piping and circulating a liquid. It is preferred to provide stirring wings in the inside of a container, and to stir using this. Stirring wings have a preferred thing of the length which reaches near the wall of a container. It is preferred to provide extra jacket wings in it, in order to update the liquid membrane of the wall of a container in the end of stirring wings. Instruments, such as a pressure gauge and a thermometer, may be installed in a container. Each ingredient is dissolved into a solvent within a container. The prepared dope is cooled using a heat exchanger etc., after taking out from an after-cooling container or taking out.

[0064]A solution can also be prepared with a cooling solution process. With a cooling solution process, making it dissolve can dissolve cellulose acetate also into a difficult organic solvent by the usual dissolving method. Even if it is a solvent which can dissolve cellulose acetate with the usual dissolving method, according to the cooling solution process, there is an effect that a promptly uniform solution is obtained. First in a cooling solution process, it adds gradually, agitating cellulose acetate in an organic solvent at a room temperature. As for the quantity of cellulose acetate, it is preferred in this mixture 10 thru/or to adjust 40 mass % So that it may be contained. As for the quantity of cellulose acetate, it is still more preferred that it is 10 thru/or 30 mass %. The arbitrary additive agents mentioned later may be added in a mixture.

[0065]Next, a mixture is cooled at -100 thru/or -10 ° (preferably -80 thru/or -10 °, still more preferably -50 thru/or -20 °, most preferably -50 thru/or -30 °). Cooling can be carried out in a dry ice methanol bath (-75 °) or a cooled diethylene-glycol solution (-30 thru/or -20 °), for example. If it cools in this way, a mixture of cellulose acetate and an organic solvent will be solidified. As for a cooling rate, it is preferred that it is [4 °] above by /, it is still more preferred that it is [8 °] above by /, and it is most preferred that it is [12 °] above by /. Although a cooling rate is so preferred that it is quick, it is a maximum with a second theoretical in 10000

° /, and is a maximum with a second technical in 1000 ° /, and is a maximum with a second practical in 100 ° / . A cooling rate is the value which broke a difference of temperature when starting cooling, and final cooling temperature in time after starting cooling until it reaches final cooling temperature.

[0066]If this is warmed at 0 thru/or 200 ° (preferably 0 thru/or 150 °, still more preferably 0 thru/or 120 °, most preferably 0 thru/or 50 °), cellulose acetate will dissolve into an organic solvent. Neglecting it in a room temperature may also stop temperature up, it may be under hot bath, and may be warmed. warming -- as for speed, it is preferred that it is [4 °] above by /, it is still more preferred that it is [8 °] above by /, and it is most preferred that it is [12 °] above by /. warming -- although speed is so preferred that it is quick, it is a maximum with a second theoretical in 10000 ° /, and is a maximum with a second technical in 1000 ° /, and is a maximum with a second practical in 100 ° / . warming -- temperature in case speed starts warming, and final warming -- since warming is started for a difference with temperature -- final warming -- it is the value broken in time until it reaches temperature. A uniform solution is obtained as mentioned above. When the dissolution is insufficient, operation of cooling and warming may be repeated. It can be judged whether the dissolution is enough only by observing appearance of a solution by viewing.

[0067]In a cooling solution process, in order to avoid moisture mixing by dew condensation at the time of cooling, it is desirable to use a well-closed container. cooling -- warming -- pressurizing in operation at the time of cooling -- warming -- the time -- decompressing -- if -- dissolving time -- it can be shortened . In order to carry out application of pressure and decompression, it is desirable to use a pressure-resistant container. A solution of 20 mass % which dissolved cellulose acetate (an acetylation degree: 60.9% and viscosity average degree-of-polymerization:299) into methyl acetate with a cooling solution process, According to the differential scanning calorimetry (DSC), a quasi phase transition point of a sol state and the gel state will exist in about 33 °, and it will be in the uniform gel state below at this temperature. Therefore, more than quasi phase transition temperature needs to act as Tamotsu of this solution at about [gel phase transition-temperature plus 10 °] temperature preferably. However, this quasi phase transition temperature changes with acetylation degrees, viscosity average degrees of polymerization, solution concentration, and organic solvents to be used of cellulose acetate.

[0068]From a prepared cellulose acetate solution (dope), a cellulose acetate film is manufactured by the solvent cast method. A dope is cast on a drum or a band, evaporates a solvent, and forms a film. As for a dope before flow casting, it is preferred to adjust concentration so that the amount of solid content may be 18 thru/or 35%. As for the surface of a drum or a band, it is preferred to make mirror-finished-surface-form voice. About flow casting and a drying method in the solvent cast method. A U.S. Pat. No. 2336310 item, said 2367603

No., said 2492078 No., Said 2492977 No., said 2492978 No., said 2607704 No., said 2739069 No., Each gazette of each Description (said 2739070 No., British JP,640731,B, and the 736892 No.), JP,45-4554,B, 49-5614, JP,60-176834,A, 60-203430, and 62-115035 has a description. As for a dope, it is preferred that skin temperature casts on a drum 10 ** or less or a band. After casting, it is preferred to guess a style 2 seconds or more and to dry. An obtained film can be stripped off from a drum or a band, it can dry by an elevated-temperature wind which changed temperature one by one to further 100 to 160 **, and a remains solvent can also be evaporated. The above method has a description in JP,H5-17844,B. According to this method, it is possible to strip off from flow casting and to shorten time of until. In order to enforce this method, it is required for a dope to gel in a drum at the time of flow casting or skin temperature of a band.

[0069]It can also film-ize by flow casting more than two-layer using a prepared cellulose reed rate solution (dope). In this case, it is preferred to produce a cellulose acylate film by the solvent cast method. A dope is cast on a drum or a band, evaporates a solvent, and forms a film. As for a dope before flow casting, it is preferred to adjust concentration so that the amount of solid content may be 10 to 40%. As for the surface of a drum or a band, it is preferred to make mirror-finished-surface-form voice.

[0070]When casting two or more cellulose reed rate liquid more than two-layer, it is possible to cast two or more cellulose reed rate solutions, A film may be produced making a solution containing a cellulose reed rate cast, respectively, and making it laminate from two or more flow casting mouths which kept and provided an interval in a direction of movement of a base material, For example, it can be adapted for JP,61-158414,A, JP,H1-122419,A, JP,H11-198285,A, etc. in a method of a description. It is possible to film-ize also by casting a cellulose reed rate solution from two flow casting mouths, For example, it can carry out by a method of a description, without JP,60-27562,B, JP,61-94724,A, JP,61-947245,A, JP,61-104813,A, JP,61-158413,A, and JP,H6-134933,A. A cellulose acylate film flow casting method which wraps a flow of a hyperviscous cellulose reed rate solution of a description in a cellulose reed rate solution of hypoviscosity to JP,56-162617,A, and extrudes simultaneously the quantity and a cellulose reed rate solution of hypoviscosity may be used.

[0071]Or it is the method which it is possible for to produce a film, for example, is indicated more to JP,44-20235,B by performing second flow casting to the side which stripped off again the film molded into the base material with the first flow casting mouth using two flow casting mouths, and was in contact with the base material side. The same solution may be sufficient as the cellulose reed rate solution to cast, a different cellulose reed rate solution may be especially sufficient as it, and it is not limited. What is necessary is just to extrude the cellulose reed rate solution according to the function from each flow casting mouth, in order to give a function to two or more cellulose reed rate layers. Furthermore, casting simultaneously other

stratum functionale (for example, glue line, dye layer, antistatic layer, antihalation layer, and UV absorption layer, a polarizing layer, etc.) can also carry out a cellulose reed rate solution. [0072]In monolayer liquid, in that case, in order to use required film thickness, it is required at high concentration to extrude a hyperviscous cellulose reed rate solution, and the stability of a cellulose reed rate solution is bad, and it is generated by the solid, and becomes BUTSU failure, or smoothness is poor, and it becomes a problem in many cases. By casting two or more cellulose reed rate solutions from a flow casting mouth as this solution, It can extrude a hyperviscous solution on a base material simultaneously, and it can attain the reduction of drying load by using a thick cellulose reed rate solution, and smoothness not only can also produce the film of the surface state which improved and was excellent, but can raise the production speed of a film.

[0073]In a cellulose acetate film, in order to improve mechanical properties, or in order to improve a drying rate, a plasticizer can be added. Phosphoric ester or carboxylate is used as a plasticizer. Triphenyl phosphate (TPP) and tricresyl phosphate (TCP) are contained in the example of phosphoric ester. As carboxylate, phthalic ester and citrate are typical. Dimethyl phthalate (DMP), diethyl phthalate (DEP), dibutyl phthalate (DBP), dioctyl phthalate (DOP), diphenyl phthalate (DPP), and diethylhexyl phthalate (DEHP) are contained in the example of phthalic ester. O-acetyl triethyl citrate (OACTE) and O-acetyltributyl citrate (OACTB) are contained in the example of citrate. Butyl oleate, methyl ricinoleate acetyl, dibutyl sebacate, and various trimellitic acid ester are contained in the example of other carboxylate. A phthalate ester plasticizer (DMP, DEP, DBP, DOP, DPP, DEHP) is used preferably. DEP and especially DPP are preferred. As for the addition of a plasticizer, it is preferred that it is 0.1 thru/or 25 mass [of the quantity of cellulose ester] %, it is still more preferred that it is 1 thru/or 20 mass %, and it is most preferred that it is 3 thru/or 15 mass %.

[0074]In a cellulose acetate film, a deterioration prevention agent (an example, an antioxidant, a peroxide decomposition agent, radical inhibitor, a metal deactivator, an acid trapping agent, amine) may be added. About a deterioration prevention agent, each gazette of JP,H3-199201,A, 5-1907073, 5-194789, 5-271471, and 6-107854 has a description. As for an addition of a deterioration prevention agent, it is preferred that it is 0.01 thru/or 1 mass [of a solution (dope) to prepare] %, and it is still more preferred that it is 0.01 thru/or 0.2 mass %. An effect of a deterioration prevention agent is hardly accepted that an addition is less than 0.01 mass %. If an addition exceeds 1 mass %, bleed out (oozing out) of a deterioration prevention agent to a film surface may be accepted. As an example of a desirable deterioration prevention agent, butylated hydroxytoluene (BHT) and tribenzylamine (TBA) can be mentioned especially.

[0075][A surface treatment of a cellulose acetate film] As for a cellulose acetate film, it is preferred to perform a surface treatment. As the concrete method, corona discharge treatment,

glow discharge processing, flame treatment, acid treatment, alkali treatment, or UV irradiation treatment is mentioned. Providing an under coat is also preferably used for the JP,H7-333433,A Description like a description. It is preferred that temperature of a cellulose acetate film of below T_g shall specifically be 150 °C or less in these processings from a viewpoint of holding the smoothness of a film. When using it as a transparent protective film of a polarizing plate, especially a thing for which acid treatment or alkali treatment, i.e., saponification processing to cellulose acetate, is carried out from an adhesive viewpoint with a polarization film is preferred. As for surface energy, it is preferred that they are 55 or more mN/m, and it is still more preferred that it is [60 or more mN/m] 75 or less mN/m.

[0076]Hereafter, alkali saponification treatment is concretely explained to an example. After a film surface is immersed in an alkali solution, it is preferred to be carried out in the cycle neutralized, rinsed and dried with an acidic solution. As an alkali solution, a potassium hydroxide solution and a sodium hydroxide solution are mentioned, as for the normal concentration of a hydroxyl ion, it is preferred that it is 0.1N thru/or 3.0N, and it is still more preferred that it is 0.5N thru/or 2.0N. Alkali solution temperature has a room temperature thru/or the preferred range of 90 °C, and is still more preferred. [of 40 °C thru/or 70 °C] It is preferred to apply lye and to carry out alkali removal from a film surface by rinsing after saponification treatment from a viewpoint of productivity. From a wettable viewpoint, as a coating solvent, alcohols, such as IPA, n-butanol, methanol, and ethanol, are preferred, and adding water, propylene glycol, ethylene glycol, etc. as an auxiliary agent of alkali dissolution is used preferably. "The foundation of wetting and application" (1989.12.rear rise company 10 issue) can be asked for solid surface energy like a description with an angle-of-contact method, a humid thermal process, and an adsorption process. In the case of the cellulose acetate film of this invention, it is preferred to use an angle-of-contact method. They are the tangent which surface energy trickled into the cellulose acetate film two sorts of solutions which are known, and specifically drew to droplet on the intersection of the surface of droplet, and a film surface, and an angle which a film surface makes, The angle of the direction containing droplet is defined as an angle of contact, and the surface energy of a film can be computed by calculation.

[0077]A rod-like liquid crystal or a discotic liquid crystal may be sufficient as the liquid crystal compound used for <optical anisotropic layer [liquid crystallinity compound] which consists of liquid crystal compounds> this invention, and they also contain a polymer liquid crystal or low-molecular liquid crystal, and the thing for which a bridge is constructed over low-molecular liquid crystal and that stopped showing liquid crystallinity further. A discotic liquid crystal is the most preferred as a liquid crystallinity compound of this invention.

[0078]As a desirable example of a rod-like liquid crystal, the thing of a description is raised to JP,2000-304932,A. As an example of the discotic liquid crystal of this invention, C. The report

of research of Destrade and others, Mol.Cryst.71 volume, The benzene derivative indicated to 111 pages (1981), the report of research of C.Destrade and others, Mol.Cryst.122 volume, 141 pages (1985), Physics lett, A, 78 volumes, The torr KISEN derivative indicated to 82 pages (1990), the report of research of B.Kohne and others, Angew.Chem.96 volume, the cyclohexane derivative indicated to 70 pages (1984), and the report of research of J.M.Lehn and others, J. The report of research of Chem.Comm., 1794 pages (1985), J.Zhang and others, J.Am.Chem.Soc.116 volume, an aza crown system, a phenylacetylene system macroscopic cycle that are indicated to 2655 pages (1994), etc. can be mentioned. The above-mentioned discotic liquid crystal generally makes these the mother nucleus based on molecules, and the alkyl group of a straight chain, an alkoxy group, a substitution benzyloxy group, etc. are the structures replaced in the shape of radiation as the straight chain, and it shows liquid crystallinity. However, if the molecule itself has optically uniaxial [negative] and it can give fixed orientation, it will not be limited to the above-mentioned description. having formed from the disc-like compound in this invention, The thing made eventually does not need to be said compound, for example, it has a basis to which said low molecule discotic liquid crystal reacts with heat, light, etc., and what polymerized or constructed the bridge, carried out polymer quantification by a reaction, and lost liquid crystallinity with heat, light, etc. as a result is contained. The desirable example of the above-mentioned discotic liquid crystal is indicated to JP,H8-50206,A.

[0079]An optical anisotropic layer of this invention is a layer which has a negative double reflex which consists of a compound which has a discotheque structural unit, And it is preferred that a field of a discotheque structural unit inclines to a transparent substrate side, and an angle of a field of this discotheque structural unit and a transparent substrate side to make is changing to a depth direction of an optical anisotropic layer.

[0080]Generally, an angle (angle of inclination) of a field of the above-mentioned discotheque structural unit is a depth direction of an optical anisotropic layer, and is increasing or decreasing with an increase in distance from the bottom of an optical anisotropic layer. As for the above-mentioned angle of inclination, increasing with an increase in distance is preferred. Intermittent change etc. which include change including a continuous increase, continuous reduction, an intermittent increase, intermittent reduction, a continuous increase, and continuous reduction, an increase, and reduction as change of an angle of inclination can be mentioned. Intermittent change includes a field where an angle of inclination does not change in the middle of a thickness direction. Even if an angle of inclination includes a field not changing, increasing or decreasing as a whole is preferred. As for an angle of inclination, it is preferred that increasing as a whole changes continuously desirable especially.

[0081]Generally a solution which dissolved a discotheque compound and other compounds in a solvent is applied on an orienting film, it dries, and, subsequently the above-mentioned

optical anisotropic layer is heated to discotheque nematic phase forming temperature, and is obtained by maintaining an oriented state (discotheque nematic phase) after that, and cooling. Or the above-mentioned optical anisotropic layers are a discotheque compound and other compounds (further). For example, a solution which dissolved a polymerization nature monomer and a photopolymerization initiator in a solvent is applied on an orienting film, it dries, after heating to discotheque nematic phase forming temperature subsequently, it polymerizes (exposure of UV light, etc.), and it is obtained by cooling further. As a discotheque nematic-liquid-crystal phase-solid-phase-transfer temperature of a discotic liquid crystal nature compound used for this invention, 70-300 °C is preferred and 70-170 °C is especially preferred.

[0082]For example, the angle of inclination of the discotheque unit by the side of a base material can be adjusted, choosing the material of a discotheque compound or an orienting film generally, or when a rubbing treatment method chooses. The angle of inclination of the discotheque unit by the side of the surface (air side) can be adjusted by choosing other compounds (an example, a plasticizer, a surface-active agent, a polymerization nature monomer, and polymer) generally used with a discotheque compound or a discotheque compound. The grade of change of an angle of inclination can also be adjusted with the above-mentioned selection.

[0083]As the above-mentioned plasticizer, a surface-active agent, and a polymerization nature monomer, it has a discotheque compound and compatibility, and unless it can give change of the angle of inclination of a liquid crystallinity discotheque compound or orientation is checked, any compounds can be used. In these, a polymerization nature monomer (compound which has an example, a vinyl group, a vinyloxy group, an acrylyl group, and a methacryloyl group) is preferred. Generally the above-mentioned compound is used to a discotheque compound in the quantity of 1 - 50 mass % (preferably five to 30 mass %). Polyfunctional acrylate is mentioned as an example of a desirable polymerization nature monomer. As for the number of functional groups, three or more organic functions are preferred, and its four or more organic functions are still more preferred. 6 organic-functions monomer is the most preferred. Dipenta ERISUTORITURU hexa acrylate is mentioned as a desirable example of 6 organic-functions monomer. It is also possible to mix and use the polyfunctional monomer from which these functional group numbers differ.

[0084]Any polymer can be used, as long as it has a discotheque compound and compatibility and change of an angle of inclination can be given to a liquid crystallinity discotheque compound as the above-mentioned polymer. Cellulose ester can be mentioned as an example of polymer. As a desirable example of cellulose ester, cellulose acetate, cellulose acetate propionate, hydroxypropylcellulose, and cellulose acetate butylate can be mentioned. Generally the above-mentioned polymer is used to a discotheque compound in quantity of 0.1 - 10 mass % (preferably 0.1 to 8 mass %, especially 0.1 to 5 mass %) so that orientation of a

liquid crystallinity discotheque compound may not be checked. It is preferred that it is the film which consists of a discotic liquid crystal formed in this invention on a cellulose acetate film, an orienting film provided on it, and an orienting film, and consists of polymer by which the bridge was constructed over an orienting film and by which rubbing treatment was carried out.

[0085]A [orienting film] An orienting film of this invention is a layer which consists of two sorts of polymer over which the bridge was constructed. Even if at least one sort of polymer is polymer which can construct a bridge in itself, all of polymer over which a bridge is constructed by cross linking agent can be used. Whether by light, heat, PH change, etc., the above-mentioned orienting film is made to react between polymer, and forms what introduced a functional group into polymer or polymer which has a functional group;. Or it can form by introducing bond groups originating in a cross linking agent, and constructing a bridge in between polymer between polymer, using a cross linking agent which is a high compound of labile.

[0086]After such bridge construction applies coating liquid which usually contains a mixture of the above-mentioned polymer or polymer, and a cross linking agent on a transparent substrate, it is carried out by performing heating etc., but. Since what is necessary is just to be able to secure endurance in a stage of an end product, processing made to construct a bridge in which stage until it obtains the last optical compensating sheet after painting an orienting film on a transparent substrate may be performed. After considering the stacking tendency of a compound (optical anisotropic layer) which has the disc-like structure formed on an orienting film a compound which has disc-like structure carries out orientation, it is also preferred to construct a bridge enough. Namely, when coating liquid containing a cross linking agent which can construct a bridge in polymer and this polymer on a transparent substrate is applied, after carrying out stoving (although bridge construction is generally performed) . When cooking temperature is low and it is heated by discotheque nematic phase forming temperature, bridge construction progresses further. Rubbing treatment is performed, an orienting film is formed, after applying coating liquid containing a compound which, subsequently to this orienting film top, has a disc-like structural unit and heating it more than discotheque nematic phase forming temperature, it cools and an optical anisotropic layer is formed.

[0087]All of polymer over which a bridge is constructed by polymer which can construct a bridge in itself, or cross linking agent can be used for polymer used for an orienting film of this invention. Of course, there is both also possible polymer. As an example of the above-mentioned polymer, polymethylmethacrylate, acrylic acid/methacrylic acid copolymer, Styrene / maleimide copolymer, polyvinyl alcohol, and denaturation polyvinyl alcohol, Poly (N-methylolacrylamide), styrene / vinyltoluene copolymer, Chlorosulfonated polyethylene, a nitrocellulose, polyvinyl chloride, Chlorinated polyolefins, polyester, polyimide, vinyl acetate/vinyl chloride copolymer, Compounds, such as polymer, such as ethylene/vinyl acetate

copolymer, carboxymethyl cellulose, polyethylene, polypropylene, and polycarbonate, and a silane coupling agent, can be mentioned. As an example of desirable polymer, poly (N-methylolacrylamide), It is water-soluble polymer, such as carboxymethyl cellulose, gelatin, poly BIRUARUKORU, and denaturation polyvinyl alcohol, Gelatin, poly BIRUARUKORU, and denaturation polyvinyl alcohol are still more preferred, and poly BIRUARUKORU and denaturation polyvinyl alcohol can be mentioned especially.

[0088]In the above-mentioned polymer, polyvinyl alcohol or denaturation polyvinyl alcohol is preferred, and it is most preferred to use together polyvinyl alcohol in which degrees of polymerization differ, or two kinds of denaturation polyvinyl alcohol. As polyvinyl alcohol, it is a thing of 70 to 100% of a saponification degree, for example, generally is a thing of 80 to 100% of a saponification degree, and is a thing of 85 thru/or 95% of a saponification degree more preferably. As a degree of polymerization, that of 100-3000 also has a preferred range. What carried out copolymerization denaturation as denaturation polyvinyl alcohol (as a denaturation group) for example, COONa, Si(OX)₃, and N(CH₃)₃ and Cl, C₉, and H₁₉COO, SO₃, Na, C₁₂H₂₅, etc. are introduced -- what denaturalized by chain transfer (as a denaturation group) For example, a denaturation thing of polyvinyl alcohol, such as what carried out denaturation by block polymerization (as a denaturation group, COOH, CONH₂, COOR, C₆H₅, etc. are introduced, for example), in which COONa, SH, C₁₂H₂₅, etc. are introduced can be mentioned.

In these, it is un-denaturalizing of 80 to 100% of a saponification degree thru/or denaturation polyvinyl alcohol, and they are un-denaturalizing of 85 thru/or 95% of a saponification degree thru/or alkylthio denaturation polyvinyl alcohol more preferably. A synthesizing method of these denaturation polymer, visible-absorption-spectrum measurement, a deciding method of the introduction rate y, etc. have a description in JP,H8-338913,A in detail.

[0089]Although the following can be mentioned as an example of a cross linking agent used with polymer, such as the above-mentioned polyvinyl alcohol, these are preferred when using together with the water-soluble above-mentioned polymer especially polyvinyl alcohol, and denaturation polyvinyl alcohol (the above-mentioned specific denaturation thing is also included). For example, aldehyde (an example, formaldehyde, glyoxal, and glutaraldehyde). N-methylol compound (an example, a dimethylolurea, and methyloldimethylhydantoin), a compound (an example,) which acts by activating a dioxane derivative (an example, 2,3-dihydroxydioxane) and a carboxyl group Carbenium, 2-naphthalene sulfonate, 1,1-screw pyrrolidino 1-chloropyridinium, and 1-morpholino carbonyl 3- (sulfonate aminomethyl), an activity vinyl compound (an example, and 1, 3 and 5 - doria -- clo yl- hexahydro s-triazine.) Bis (vinylsulfone)methane and N,N'-methylenebis [beta-(vinylsulfonyl) propionamide], an active halogen compound (an example, 2,4-dichloro-6-hydroxy-S-triazine), isoxazoles, dialdehyde starch, etc. can be raised. These can be independent, or can be combined and can be used.

When productivity is taken into consideration, use of the high aldehyde of labile and division glutaraldehyde is preferred.

[0090]As a cross linking agent, there is no limitation in particular and an addition has the direction added mostly in an improvement tendency about moisture resistance. However, since it falls when the orientability as an orienting film adds to polymer in more than 50 mass %, 0.1 - 20 mass % is preferred, and 0.5 - 15 mass % is especially preferred. The orienting film of this invention contains the cross linking agent which did not react to some extent, also after crosslinking reaction is completed, but as for the quantity of the cross linking agent, it is preferred in an orienting film that it is below 1.0 mass %, and it is especially preferred that it is below 0.5 mass %. Sufficient endurance will not be obtained if the cross linking agent is contained in the quantity exceeding 1.0 mass in the orienting film. That is, when it is used for a liquid crystal display and neglected under long-term use or the atmosphere of high-humidity/temperature for a long period of time, RECHIKYU ration may occur.

[0091]After applying the orienting film of this invention fundamentally on the above-mentioned polymer which is an orienting film formation material, and the transparent substrate containing a cross linking agent, can carry out stoving (making a bridge construct) of it, and it can be formed by carrying out rubbing treatment, and crosslinking reaction as mentioned above, After applying on a transparent substrate, it may carry out at arbitrary stages. And in using water-soluble polymer, such as the aforementioned polyvinyl alcohol, as an orienting film formation material. As for coating liquid, it is preferred to consider it as organic solvents, such as methanol with a defoaming operation, and the mixed solvent of water, and, as for the ratio, it is preferred that 0:100-99:1 are common as for water:methanol, and it is 0:100-91:9 in a mass ratio. Thereby, generating of a bubble is suppressed and the defect of the layer surface of an orienting film and also an optical anisotropic layer decreases remarkably. As a coating method, the spin coating method, the dip-coating method, the curtain coating method, an extrusion coating method, the BAKOTINGU method, and the E type applying method can be mentioned. The E type applying method is especially preferred. 0.1-10 micrometers of thickness are preferred. Stoving can be performed at 20 ** thru/or 110 **. In order to make sufficient bridge construction form, 60 ** - 100 ** are preferred, and 80 ** - 100 ** are especially preferred. Drying time can be performed in 1 minute - 36 hours. It is for 5 minutes thru/or for 30 minutes preferably. It is preferred to set it as the optimal value for the cross linking agent to be used, also as for pH, when glutaraldehyde is used, it is pH 4.5-5.5 and especially 5 is preferred.

[0092]An orienting film is provided on a transparent substrate or the above-mentioned undercoat. An orienting film can be obtained by carrying out rubbing treatment of the surface, after constructing a bridge in a polymer layer as mentioned above. An orienting film functions as specifying the orientation direction of a liquid crystallinity disocetheque compound provided on it.

[0093] Said rubbing treatment can use the disposal method widely adopted as liquid-crystal-orientation down stream processing of LCD. That is, the method of obtaining orientation can be used by grinding the surface of an orienting film against a certain direction using paper, gauze, felt, rubber or nylon, polyester fiber, etc. It carries out by generally performing rubbing about several times using the cloth etc. which transplanted hair on the average in fiber with uniform length and thickness.

[0094] a <transparent substrate which paints optical anisotropic layer which consists of liquid crystal compounds> this transparent substrate -- high -- if it is a transmissivity plastic film, there will be no restriction in particular, but it is preferred to use the cellulose acetate which is a protective film of a polarizing plate. It may be optically biaxial also in 1 axially optically. In order that itself may play an important role optically, the transparent substrate which paints an optical anisotropic layer is 0 thru/or 200 nm about R_e retardation values of the transparent substrate of this invention, and it is preferred that R_{th} retardation values are adjusted by 70 thru/or 400 nm. As for the R_{th} retardation values of a film, when using the optical anisotropy cellulose acetate film of two sheets for a liquid crystal display, it is preferred that it is 70 thru/or 250 nm. As for the R_{th} retardation values of a film, when using the optical anisotropy cellulose acetate film of one sheet for a liquid crystal display, it is preferred that it is 150 thru/or 400 nm. As for the double refraction factor ($\Delta n: n_x - n_y$) of a cellulose acetate film, it is preferred that it is 0.00 thru/or 0.002. As for the double refraction factor $\{(n_x + n_y)/2 - n_z\}$ of the thickness direction of a cellulose acetate film, it is preferred that it is 0.001 thru/or 0.04. Retardation values (R_e) are computed according to a following formula.

Among a retardation-values (R_e) $= (n_x - n_y) \times d$ type, n_x is a refractive index (maximum refractive index within a field) of the direction of a lagging axis within the field of a phase difference plate, and; n_y is a refractive index of a direction vertical to the lagging axis within the field of a phase difference plate.

//(II) $R_{th} = \{ -- \}$ it $(n_x + n_y)$ is a refractive index of the direction of a lagging axis in a film plane (direction from which a refractive index serves as the maximum) at $2 - n_z$ $\times d$ type (II). n_y is a refractive index of the phase leading shaft orientations (direction from which a refractive index serves as the minimum) in a film plane. n_z is a refractive index of the thickness direction of a film. d is the thickness of the film which sets a unit to nm.

[0095] [Polarizing plate] A polarizing plate consists of a protective film of two sheets arranged at a polarization film and its both sides. As one protective film, the light diffusing film of this invention and an antireflection film can be used. The usual cellulose acetate film may be used for the protective film of another side. Polarization films include an iodine system polarization film, and the color system polarization film and polyene system polarization film which use dichromatic dye. Generally an iodine system polarization film and a color system polarization film are manufactured using a polyvinyl alcohol system film. The transparent base material of a

light diffusing film, the lagging axis of a cellulose acetate film, and the transmission axis of a polarization film are arranged so that it may become parallel substantially. The productivity of the polarizing plate found that the moisture permeability of a protective film was important. The polarization film and the protective film are pasted together with drainage system adhesives, and this adhesives solvent is diffusing the inside of a protective film, and is dried. The more the moisture permeability of a protective film is high, the more the desiccation of productivity improves early, but if it becomes high too much, polarization ability will fall by the operating environment (under highly humid) of a liquid crystal display because moisture enters into a polarization film. The moisture permeability of a polarizing plate is determined by the thickness of a transparent base material and a polymer film (and polymerization nature liquid crystal compound), free volume, relative-degree-of-intimacy aqosity, etc. When using the light diffusing film of this invention, and an antireflection film as a protective film of a polarizing plate, as for moisture permeability, it is preferred that they are 100 thru/or 1000g / m², and 24hrs, and it is still more preferred that they are 300 thru/or 700g / m², and 24hrs. In film production, the thickness of a transparent base material can be adjusted with a lip flow, line speed or extension, and compression. Since moisture permeability changes with main materials to be used, it is possible to use the desirable range by thickness adjustment. In film production, the free volume of a transparent base material can be adjusted with drying temperature and time. Since moisture permeability changes also in this case with main materials to be used, it is possible to use the desirable range by free volume adjustment. The relative-degree-of-intimacy aqosity of a transparent base material can be adjusted with an additive agent. Moisture permeability becomes high by adding a hydrophilic additive agent in the above-mentioned free volume, and moisture permeability can be made low by adding a hydrophobic additive agent conversely. By controlling the above-mentioned moisture permeability independently, it becomes possible to manufacture the polarizing plate which has optical compensation ability for inexpensive high productivity. The polarizing plate which laminated the optical anisotropic layer which consists of the light diffusing film of this invention or an antireflection film, light polarizer, and a liquid crystallinity compound in this invention in this order is preferred. The optical anisotropic layer may be formed on the polymer film as a layer containing a disc-like compound (discotheque compound) or a rod-like liquid crystal compound. In this invention, it is preferred that a liquid crystallinity compound is a discotheque compound. As for an optical anisotropic layer, it is preferred to form by carrying out orientation of the disc-like compound (or rod-like liquid crystal compound), and fixing the oriented state. Generally a disc-like compound has a big double refraction factor. There are various orientation forms in a disc-like compound. Therefore, it can be considered as the optical anisotropic layer which has an optical property which cannot be acquired in the conventional extension double refraction film by using a disc-like compound. About the optical anisotropic

layer using a disc-like compound, each Description of JP,H6-214116,A, a U.S. Pat. No. 5583679 item, said 5646703 No., and West German Patent Gazette 3911620A No. 1 has a description.

[0096][Liquid crystal display] As for the light diffusing film of this invention, an antireflection film, or a polarizing plate, it is preferred for it to be used in favor of a liquid crystal display, and to use for the outermost layer of a display. TN, MVA, and the liquid crystal display of an OCB mode consist of two polarizing plates arranged at a liquid crystal cell and its both sides. The liquid crystal cell is supporting the liquid crystal between the electrode substrates of two sheets. In a liquid crystal display, one optical anisotropic layer is arranged between a liquid crystal cell and one polarizing plate, or is arranged two sheets between a liquid crystal cell and both polarizing plates.

[0097]As for a liquid crystal cell, it is preferred that they are VA mode, an OCB mode, or a TN mode. In the liquid crystal cell in VA mode, the rod-like liquid crystallinity molecule is carrying out orientation vertically substantially at the time of impressing no voltage.

[0098]the liquid crystal cell in VA mode -- (1) -- orientation of the rod-like liquid crystallinity molecule being vertically carried out substantially at the time of impressing no voltage, and, At the time of voltage impressing, horizontally substantially to the liquid crystal cell (JP,H2-176625,A description) in VA mode of the narrow sense which carries out orientation In addition, for (2) angle-of-visibility expansion, The liquid crystal cell (MVA mode) (SID97, Digest of tech. Papers(proceedings)28 (1997) 845 description) which multi-domains-sized VA mode, (3) Carry out perpendicular orientation of the rod-like liquid crystallinity molecule substantially at the time of impressing no voltage, It is twisted at the time of voltage impressing, and the liquid crystal cell (58 to proceedings 59 (1998) description of a Japanese liquid crystal debate) in a mode (n-ASM mode) and the liquid crystal cell (LCD International 98 announces) in (4) SURVAIVAL mode which carry out multi-domains orientation are contained.

[0099]The liquid crystal cell of an OCB mode is a liquid crystal display using the liquid crystal cell in the bend orientation mode to which the orientation (symmetrically) of the rod-like liquid crystallinity molecule is made to carry out in the reverse direction substantially in the upper part and the lower part of a liquid crystal cell, and is indicated by each Description (a U.S. Pat. No. 4583825 item and the 5410422 No.). Since the rod-like liquid crystallinity molecule is carrying out orientation symmetrically in the upper part and the lower part of the liquid crystal cell, as for the liquid crystal cell in bend orientation mode, it has a self-optical compensation function. Therefore, this liquid crystal mode is also called OCB (Optically Compensatory Bend) liquid crystal mode. There is an advantage that the liquid crystal display in bend orientation mode has quick speed of response.

[0100]In the liquid crystal cell of the TN mode, at the time of impressing no voltage, a rod-like liquid crystallinity molecule carries out level orientation substantially, and is twisting and

carrying out orientation to 60 thru/or 120 more degrees. Most liquid crystal cells as a color TFT-liquid-crystal display device of the TN mode are used, and much document has a description.

[0101]

[Working example]Hereafter, although this invention is explained with an embodiment, this invention is not limited to these.

(Embodiment 1) The translucency resin which constitutes a light diffusion layer, Ultraviolet curing type resin (the product made from DESORAITO Z7526JSR, the refractive index 1.51) to 100 mass parts as translucency particles, Bridge construction styrene bead (Soken Chemical & Engineering SX130H and the particle diameter of 1.3 micrometers) the refractive index 1.61 -- 33 mass parts and a bridge construction styrene bead (Soken Chemical & Engineering SX350H.) What adjusted the particle diameter of 3.5 micrometers, and the refractive index 1.61 so that 11 mass parts and these might be mixed and it might become 50% of solid content by methyl ethyl ketone/methyl isobutyl ketone (20/80 mass ratio), On a triacetyl cellulose film (the Fuji Photo Film Co., Ltd. make, TD-80U), The air-cooling metal halide lamp (product made from Eye Graphics) of 160 W/cm is used after a coating and solvent desiccation so that it may become 3.5 micrometers of dry membrane thickness, It irradiated with the ultraviolet rays of illumination 400mW/cm² and dose 300 mJ/cm², the coating layer was stiffened, and the light diffusing film (HKF-01) was produced.

[0102]When Hayes (haze value) of HKF-01 was measured, it is 55% and became moderate Hayes. Surface roughness is 0.16 micrometer.

Image clarity was 41%.

(Evaluation of surface roughness and image clarity is carried out to the text by the method of a description.) Hereafter, it is the same.

[0103](Embodiment 2) The translucency resin which constitutes a light diffusion layer, zirconium oxide dispersed matter content hard court coating liquid (DESORAITO KZ-7114A.) 100 copies and translucency resin (Nippon Kayaku DPHA) for the product made from JSR 43 mass parts, A hardening initiator (the Ciba-Geigy make, IRGACURE 184) And five mass parts, After mixing stirring these by exhaust air DISUPA and dissolving in methyl ethyl ketone / methyl-isobutyl-ketone (20/80 mass ratio) solution, the refractive index of spreading and the coat produced by carrying out ultraviolet curing was 1.64. It is a polymethylmethacrylate system bead (Soken Chemical & Engineering MX150 and the particle diameter of 1.5 micrometers) as translucency particles to this solution. the refractive index 1.53 -- 21 mass parts and a polymethylmethacrylate system bead (the Soken Chemical & Engineering make.) MX300 what adjusted the particle diameter of 3.0 micrometers, and the refractive index 1.53 so that 8.5 mass parts and these might be mixed and it might become 53% of solid content by methyl ethyl ketone/methyl isobutyl ketone (10/90 mass ratio), On a triacetyl cellulose film (the

Fuji Photo Film Co., Ltd. make, TD-80U), The air-cooling metal halide lamp (product made from Eye Graphics) of 160 W/cm is used after a coating and solvent desiccation so that it may become 4.0 micrometers of dry membrane thickness, It irradiated with the ultraviolet rays of illumination 400mW/cm^2 and dose 300 mJ/cm^2 , the coating layer was stiffened, and the light diffusing film (HKF-02) was produced.

[0104]When Hayes (haze value) of HKF-02 was measured, it is 63% and became moderate Hayes. Surface roughness is 0.15 micrometer.

Image clarity was 55%.

[0105](Preparation of the coating liquid for low refractive index layers) It is MEK-ST (the mean particle diameter of 10-20 nm) to 93 g of heat cross-linking fluorine-containing polymer (JN-7228, product made from JSR) of the refractive index 1.42. The methyl-ethyl-ketone (MEK) dispersed matter of the SiO_2 sol of solids concentration 30 mass %, the product 8g made from Nissan Chemistry, and 100 g of methyl ethyl ketone were filtered with the filter made from polypropylene with the aperture of 1 micrometer after addition and stirring, and the coating liquid for low refractive index layers was prepared.

[0106](Embodiment 3) On the light diffusion layer of HKF-01, the bar coating machine was used and applied, heat bridge construction of the above-mentioned coating liquid for low refractive index layers was carried out for 10 minutes at 120 more ° after desiccation at 80 °, the 0.096-micrometer-thick low refractive index layer was formed, and the antireflection film (HKHB-01) was produced.

[0107](Embodiment 4) On the light diffusion layer of HKF-02, the bar coating machine was used and applied, heat bridge construction of the above-mentioned coating liquid for low refractive index layers was carried out for 10 minutes at 120 more ° after desiccation at 80 °, the 0.096-micrometer-thick low refractive index layer was formed, and the antireflection film (HKHB-02) was produced.

[0108](Comparative example 1) Translucency resin which constitutes a light diffusion layer, Ultraviolet curing type resin (a product made from DESORAITO Z7526JSR, the refractive index 1.51) to 100 mass parts as translucency particles, a benzoguanamine melamineformaldehyde system bead (the NIPPON SHOKUBAI make.) particle diameter of 0.5 micrometer, and the refractive index 1.68 -- 12 mass parts and a bridge construction styrene bead (Soken Chemical & Engineering SX350H.) What adjusted particle diameter of 3.5 micrometers, and the refractive index 1.61 so that 11 mass parts and these might be mixed and it might become 50% of solid content with methyl ethyl ketone/acetone (40/60 mass ratio), On a triacetyl cellulose film (the Fuji Photo Film Co., Ltd. make, TD-80U), An air-cooling metal halide lamp (product made from Eye Graphics) of 160 W/cm is used after a coating and solvent desiccation so that it may become 3.0 micrometers of dry membrane thickness, It

irradiated with ultraviolet rays of illumination/cm[of $400\text{ mW}]^2$, and dose 300 mJ/cm^2 , a coating layer was stiffened, and a light diffusing film (HKF-H1) was produced.

[0109]When Hayes (haze value) of HKF-H1 is measured, it is 50%, and surface roughness is 0.35 micrometer although it became moderate Hayes.

Image clarity was 12%.

[0110](Evaluation of an antireflection film) The following items were evaluated about an obtained light diffusing film.

(1) In [equip mirror reflectivity and the tint spectrophotometer V-550 (made by Jasco Corp.) with adapter ARV-474, and] a 380-780-nm wavelength zone, The emitting angle-5 degree mirror reflectivity in 5 degrees of incidence angles was measured, the average reflectance of 450-650 nm was computed, and acid resistibility was evaluated.

[0111](2) Hayes of the Hayes profitable **** film was measured using hazemeter MODEL 1001DP (made by Nippon Denshoku Industries Co., Ltd.). The removed value showed Hayes of the transparent base material and the low refractive index layer itself.

[0112](3) Pencil hardness evaluation of the description was performed to JIS K 5400 as an index of pencil hardness evaluation damage resistance. After controlling the humidity of an antireflection film by the temperature of 25 °, and 60% of humidity RH for 2 hours, 1 kg of load estimated on the following standards using the pencil for an examination of 3H specified to JIS S 6006.

In evaluation of :O n=5 to which a crack is not accepted at all in evaluation of n= 5, a crack is 1 or two. : In evaluation of ° n=5, a crack is three or more. : x[0113](4) As a contamination-resistant (fingerprint adhesion) index of the angle-of-contact measurement surface, after controlling the humidity of an optical material by the temperature of 25 °, and 60% of humidity RH for 2 hours, the angle of contact over water was measured.

[0114](5) A dynamic friction coefficient estimated as an index of dynamic friction coefficient measurement surface slide nature. A dynamic friction coefficient used a value measured with HEIDON-14 dynamical-friction measuring apparatus in a 5 mmphi stainless steel ball, 100 g of load, and speed 60 cm/min, after controlling the humidity of a sample with 25 ° and 60% of relative humidity for 2 hours.

[0115](6) An unreserved fluorescent lamp (8000-cd/m^2) without a louver was projected on an anti-dazzle property film which carried out anti-dazzle property evaluation creation, and the following standards estimated a grade of a Japanese quince of the reflected figure.

An outline of a fluorescent lamp is not known at all. : O An outline of a fluorescent lamp is known slightly. : O An outline is discriminable although a fluorescent lamp is fading. : ° fluorescent lamp hardly fades. : x[0116](7) A surface resistance value was measured with a circle electrode method about samples of all surface resistance values, and it checked that it

was 1×10^{12} omega / more than **.

[0117](8) Vertical peel charge was measured for a vertical peel charge profitable **** film to TAC. A measuring method is as having indicated in the text.

[0118](9) Garbage antisticking nature (protection-against-dust nature)

The measurement film was stuck on the glass plate, after discharging electricity, ten round trips ground using TORESHI of Toray Industries, Inc., powder of styrene foam detailed after that was used as false garbage, the back film covered over the whole film was stood, the situation of fall of false garbage was observed, and the following four-step evaluation was performed.

O : false garbage almost falls altogether.

O : false garbage falls not less than 80%.

** : False garbage falls not less than 50%.

x : False garbage remains in the film surface not less than 50%.

[0119]The result of an embodiment and a comparative example is shown in Table 1. The following things are clear from the result shown in Table 1. The result of the evaluation in which any light diffusing film of Embodiments 3 and 4 is excellent in anti-dazzle property and acid resistibility, and reflects film properties, such as pencil hardness (as for an embodiment, all are O), fingerprint adhesion (an angle of contact is large and each embodiment is O), and surface slide nature (a dynamic friction coefficient is small and each embodiment is O), was also good. The embodiment was weak also about the tint. On the other hand, since the comparative example 1 did not have a low refractive index layer, sufficient acid resistibility was not obtained.

[0120]
[Table 1]

表 1									
実施例	比較例	実施例	比較例	実施例	比較例	実施例	比較例	実施例	比較例
例 1	例 2	例 3	例 4	例 5	例 6	例 7	例 8	例 9	例 10
透過率 (%)	85	45	85	85	85	85	85	85	85
反射率 (%)	50	50	50	50	50	50	50	50	50
反射率 (%)	50	50	50	50	50	50	50	50	50

[0121]Next, the polarizing plate was created using the film of the above-mentioned embodiment, and evaluation with a liquid crystal display was carried out.

[0122]Iodine was made to stick to the polyvinyl alcohol film of which <production of visual recognition side polarizing plate SHB-01> extension was done, and the polarization film was produced. Saponification treatment was performed to HKHB-01, and using polyvinyl alcohol system adhesives, it stuck on one side of a polarization film so that the transparent substrate film (triacetyl cellulose) of HKHB-01 might become the polarization film side. Saponification

processing was performed to optical compensation film WVSA12B (made by Fuji Photo Film) which has an optical anisotropic layer which consists of a liquid crystallinity compound, and using polyvinyl alcohol system adhesives, it stuck on the opposite hand so that film support might become the polarization film side. Thus, the visual recognition side polarizing plate (SHB-01) was produced.

[0123]Iodine was made to stick to the polyvinyl alcohol film of which <production of visual recognition side polarizing plate SHB-02> extension was done, and the polarization film was produced. Saponification treatment was performed to HKHB-02, and using polyvinyl alcohol system adhesives, it stuck on one side of a polarization film so that the transparent substrate film (triacetyl cellulose) of HKHB-02 might become the polarization film side. Saponification processing was performed to optical compensation film WVSA12B (made by Fuji Photo Film) which has an optical anisotropic layer which consists of a liquid crystallinity compound, and using polyvinyl alcohol system adhesives, it stuck on the opposite hand so that film support might become the polarization film side. Thus, the visual recognition side polarizing plate (SHB-02) was produced.

[0124]Iodine was made to stick to the polyvinyl alcohol film of which <production of back light side polarizing plate BHB-01> extension was done, and the polarization film was produced. Saponification treatment was performed on the commercial triacetyl cellulose film (Fuji Photo Film FUJITAKKUTD80), and it stuck on one side of a polarization film using polyvinyl alcohol system adhesives. Saponification processing was performed to optical compensation film WVSA12B (made by Fuji Photo Film) which has an optical anisotropic layer which consists of a liquid crystallinity compound, and using polyvinyl alcohol system adhesives, it stuck on the opposite hand so that a cellulose acetate film might become the polarization film side. Thus, the back light side polarizing plate (BHB-01) was produced.

[0125](Embodiment 5) The polarizing plate of the couple provided in the liquid crystal display (6E-A3, product made from Sharp) which uses a TN liquid crystal cell was stuck instead of peel-off via the binder at the observer side so that an optical compensation film might become the liquid crystal cell side about a polarizing plate (SHB-01). The back light side polarizing plate (BHB-01) was stuck on the back light side via the binder so that an optical compensation film might become the liquid crystal cell side. The transmission axis of the polarizing plate by the side of an observer and the transmission axis of the polarizing plate by the side of a back light have been arranged so that it may become O mode. About the produced liquid crystal display, an angle of visibility and the tint change by intermediate color (L3) were measured in eight steps from a black display (L1) to a white display (L8) using measuring apparatus (EZ-Contrast 160D, product made by ELDIM). A result is shown in the 2nd table.

[0126](Embodiment 6) The polarizing plate of the couple provided in the liquid crystal display (6E-A3, product made from Sharp) which uses a TN liquid crystal cell was stuck instead of

peel-off via the binder at the observer side so that an optical compensation film might become the liquid crystal cell side about a polarizing plate (SHB-02). The back light side polarizing plate (BHB-01) was stuck on the back light side via the binder so that an optical compensation film might become the liquid crystal cell side. The transmission axis of the polarizing plate by the side of an observer and the transmission axis of the polarizing plate by the side of a back light have been arranged so that it may become O mode. About the produced liquid crystal display, an angle of visibility and the tint change by intermediate color (L3) were measured in eight steps from a black display (L1) to a white display (L8) using measuring apparatus (EZ-Contrast 160D, product made by ELDIM). A result is shown in the 2nd table.

[0127](Comparative example 2) The polarizing plate (product LL-82-made from Sun Ritz 12WNA) of peel-off and marketing to instead of the polarizing plate of the couple provided in the liquid crystal display (6E-A3, product made from Sharp) which uses a TN liquid crystal cell was stuck. The transmission axis of the polarizing plate by the side of an observer and the transmission axis of the polarizing plate by the side of a back light have been arranged so that it may become O mode. About the produced liquid crystal display, an angle of visibility and the tint change by intermediate color (L3) were measured in eight steps from a black display (L1) to a white display (L8) using measuring apparatus (EZ-Contrast 160D, product made by ELDIM). A result is shown in the 2nd table.

[0128]

[Table 2]

表2表

例示 視野角 (コントラスト比と、零反射率のない範囲)			
表示装置	上	下	左右
実施例5	80°	75°	160°
実施例6	75°	65°	160°
比較例2	30°	15°	100°

注: 表裏の零反射率と、上と下の視野角

[0129]

[Effect of the Invention] Thus, the view angle characteristic outstanding in the antireflection film of this invention, the polarizing plate, and the liquid crystal display is shown.

[Translation done.]

* NOTICES *

JPO and INPIT are not responsible for any
damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1]A light diffusing film characterized by this light diffusion layer's being not less than 40% of a haze value in translucency resin and a light diffusing film which has at least one layer of light diffusion layers containing translucency particles, and image clarity being 30% thru/or 99% on a transparent base material.

[Claim 2]The light diffusing film according to claim 1, wherein surface roughness of this light diffusion layer is 0.05 micrometer thru/or 0.18 micrometer.

[Claim 3]In a manufacturing method of a light diffusing film which paints further a light diffusion layer containing translucency resin and translucency particles at least on a transparent base material, At least one or more kinds of solvents in which a solvent of this light diffusion layer coating liquid dissolves this transparent base material, A manufacturing method of a light diffusing film, wherein it comprises at least one or more kinds of solvents which do not dissolve this transparent base material, and this light diffusion layer is not less than 40% of a haze value and image clarity is 30% thru/or 99%.

[Claim 4]A manufacturing method of the light diffusing film according to claim 3, wherein this transparent base material is a cellulose acetate film and a solvent which does not dissolve this transparent base material is methyl isobutyl ketone.

[Claim 5]In an antireflection film which has further a light diffusion layer containing translucency resin and translucency particles at least, and has a low refractive index layer of at least one layer on it on a transparent base material, An antireflection film, wherein a haze value of this light diffusion layer is not less than 40%, image clarity is 30% thru/or 99% and average value in a wavelength zone from 450 nm to 650 nm of mirror reflectivity in 5 times incidence of an antireflection film is 2.5% or less.

[Claim 6]A polarizing plate using for one side of a protective film the light diffusing film according to claim 1 or 2, a light scattering film manufactured with the manufacturing method

according to claim 3 or 4, or the antireflection film according to claim 5 in a polarizing plate which pinched both sides of a polarizing layer with a protective film.

[Claim 7](a) Claim 1 or a light diffusing film given in 2, a light diffusing film manufactured with the manufacturing method according to claim 3 or 4 or the antireflection film according to claim 5, (b) light polarizer, and a polarizing plate laminating an optical anisotropic layer which comprises (c) liquid crystallinity compound in this order.

[Claim 8]The polarizing plate according to claim 7 in which said liquid crystallinity compound is a discotheque compound.

[Claim 9]A liquid crystal display using for the outermost layer of a display a polarizing plate given in the light diffusing film according to claim 1 or 2, a light scattering film manufactured with the manufacturing method according to claim 3 or 4, the antireflection film according to claim 5, or Claims 6-8 any 1 clause.

[Translation done.]